

a moving foraminous endless fabric;

means for depositing a nascent web for said absorbent paper sheet on said foraminous endless fabric;

a moving endless pressing blanket for pressing said absorbent paper sheet on said foraminous endless fabric, said moving endless pressing blanket having a void volume less than about $1500 \text{ cm}^3/\text{m}^2$;

a transfer cylinder; and

a pressing unit engaging said pressing blanket adapted to urge said nascent web for said absorbent paper sheet on said foraminous endless fabric into engagement with said transfer cylinder thereby forming a nip between said foraminous endless fabric and said transfer cylinder, wherein no pervious member is interposed between said transfer cylinder and said foraminous endless fabric, said pressing unit being configured to create a peak engagement pressure of at least about 2000 kN/m^2 at an overall line load of less than about 240 kN/m .

53. An apparatus for forming an absorbent paper sheet product comprising:

a moving foraminous endless fabric;

means for depositing a nascent web for said absorbent paper sheet on said foraminous endless fabric;

a moving endless pressing blanket for pressing said absorbent paper sheet on said foraminous endless fabric, said moving endless pressing blanket having a void volume of less than about $1500 \text{ cm}^3/\text{m}^2$;

a transfer cylinder; and

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a pressing unit engaging said pressing blanket adapted to urge said nascent web for said absorbent paper sheet on said foraminous endless fabric into engagement with said transfer cylinder thereby forming a nip between said foraminous endless fabric and said transfer cylinder, wherein no pervious member is interposed between said transfer cylinder and said foraminous endless fabric, said pressing unit being configured to create a peak engagement pressure of at least about 2000 kN/m².

3 54. The apparatus of claims ~~52~~ or ~~53~~, wherein said pressing unit is additionally configured to impose an asymmetrical pressure distribution upon said nascent web, said asymmetrical pressure distribution being skewed such that the pressure declines from a peak pressure to a value of 20% of said peak pressure over a nip length which is no more than about half of the nip length over which it rose to said peak pressure from 20% of said peak pressure.

4 55. The apparatus of claims ~~52~~ or ~~53~~, wherein said pressing unit comprises at least one hydraulic engagement member.

5 56. The apparatus of claim ~~55~~, wherein said at least one hydraulic engagement member has a length of less than about 3 inches.

6 57. The apparatus of claim ~~56~~, wherein said at least one hydraulic engagement member has a length of less than about 2 inches.

7 58. The apparatus of claims ~~52~~ or ~~53~~, wherein said foraminous endless fabric is a press felt or an impression blanket.

8 59. The apparatus of claims ~~52~~ or ~~53~~, wherein the means for forming a nascent web is selected from a crescent former, a twin wire former, a suction breast roll former, or a fourdrinier former.

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11/21/09 90. The apparatus of claims ⁵² or ⁵³, wherein said pressing unit is configured to have a line load of less than about 175 kN/m.

10/61. The apparatus of claims ⁵² or ⁵³, wherein said pressing unit is configured to have a line load of less than about 100 kN/m.

11/62. The apparatus of claims 52 or 53, wherein said nip is at least about 2500 kN/m².

12/63. The apparatus of claims ⁵² or ⁵³, wherein said nip is at least about 3000 kN/m².

13/64. The apparatus of claims ⁵² or ⁵³, wherein said nip is at least about 3150 kN/m².

14/65. The apparatus of claims ⁵² or ⁵³, further comprising a creping blade for removing said absorbent paper sheet from said transfer cylinder.

15/66. The apparatus of claims ⁵² or ⁵³, wherein said pressing unit is configured to disengage said web from said foraminous endless fabric such that rewet of said nascent web by said foraminous endless fabric is less than about 50% of the rewet predicted by the Sweet equations based upon the properties of said foraminous endless fabric and said nascent web.

16/67. The apparatus of claim ⁶⁶, wherein said pressing unit is configured to disengage said web from said foraminous endless fabric at a nip length of less than about one inch from the point the nip pressure reaches zero.

17/68. The apparatus of claim ⁶⁶, wherein said pressing unit is configured to both disengage said web from said foraminous endless fabric and disengage said

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foraminous endless fabric from said pressing blanket at a nip length of less than about one inch from the point the nip pressure reaches zero.

⁸⁶⁹ 70 The apparatus of claims ~~52~~⁵² and ~~53~~⁵³, wherein said transfer cylinder is heated.

²⁰ 70 The apparatus of claims ~~52~~⁵² and ~~53~~⁵³, wherein said transfer cylinder is selected from a granite roll, a cold steel roll, a gas fired heater, or a Yankee drying cylinder.

¹⁹ 71 The apparatus of claim ~~69~~¹⁸, wherein said transfer cylinder is heated by an induction heater.

72. An apparatus for forming an absorbent paper sheet product comprising:
a moving foraminous endless fabric;
means for depositing a nascent web for said absorbent paper sheet on said foraminous endless fabric;

a moving endless pressing blanket for pressing said absorbent paper sheet on said foraminous endless fabric, said moving endless pressing blanket having a void volume of less than about $1500 \text{ cm}^3/\text{m}^2$;

a backing roll; and

a pressing unit engaging said pressing blanket adapted to urge said nascent web for said absorbent paper sheet on said foraminous endless fabric into engagement with said transfer cylinder thereby forming a nip between said foraminous endless fabric and said transfer cylinder, wherein no pervious member is interposed between said transfer cylinder and said foraminous endless fabric, said pressing unit being configured to

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create a peak engagement pressure of at least about 2000 kN/m² at an overall line load of less than about 240 kN/m.

73. An apparatus for forming an absorbent paper sheet product comprising:

a moving foraminous endless fabric;

means for depositing a nascent web for said absorbent paper sheet on said foraminous endless fabric;

a moving endless pressing blanket for pressing said absorbent paper sheet on said foraminous endless fabric, said moving endless pressing blanket having a void volume of less than 1500 cm³/m²;

a backing roll; and

a pressing unit engaging said pressing blanket adapted to urge said nascent web for said absorbent paper sheet on said foraminous endless fabric into engagement with said transfer cylinder thereby forming a nip between said foraminous endless fabric and said transfer cylinder, wherein no pervious member is interposed between said transfer cylinder and said foraminous endless fabric, said pressing unit being configured to create a peak engagement pressure of at least about 2000 kN/m².

The apparatus of claims 72 or 73, wherein said pressing unit is additionally configured to impose an asymmetrical pressure distribution upon said nascent web, said asymmetrical pressure distribution being skewed such that the pressure declines from a peak pressure to a value of 20% of said peak pressure over a nip length which is no more than about half of the nip length over which it rose to said peak pressure from 20% of said peak pressure.

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24/ 75. The apparatus of claims 72 or 73, wherein said pressing unit comprises at least one hydraulic engagement member.

26/ 76. The apparatus of claim 75, wherein said at least one hydraulic engagement member has a length of less than about 3 inches.

27/ 77. The apparatus of claim 75, wherein said at least one hydraulic engagement member has a length of less than about 2 inches.

21/ 22/ 78. The apparatus of claims 72 or 73, wherein said foraminous endless fabric is a press felt or an impression blanket.

20/ 79. The apparatus of claims 72 or 73, wherein the means for forming a nascent web is selected from a crescent former, a twin wire former, a suction breast roll former, or a fourdrinier former.

21/ 22/ 80. The apparatus of claims 72 or 73, wherein said backing roll is heated.

20/ 81. The apparatus of claim 80, wherein said backing roll is heated by steam.

21/ 22/ 82. The apparatus of claim 80, wherein said backing roll is heated by induction heating.

22/ 83. The apparatus of claims 72 or 73, wherein said pressing unit is configured to have a line load of less than about 175 kN/m.

23/ 84. The apparatus of claims 72 or 73, wherein said pressing unit is configured to have a line load of less than about 100 kN/m.

85. The apparatus of claims 72 or 73, wherein said nip is at least about 2500 kN/m².

86. The apparatus of claims 72 or 73, wherein said nip is at least about 3000 kN/m².

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